END
DATE
FILMED

11-84

DTIC
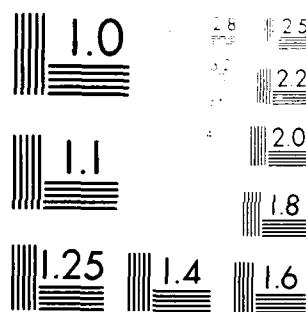
MICROCOPY RESOLUTION TEST CHART
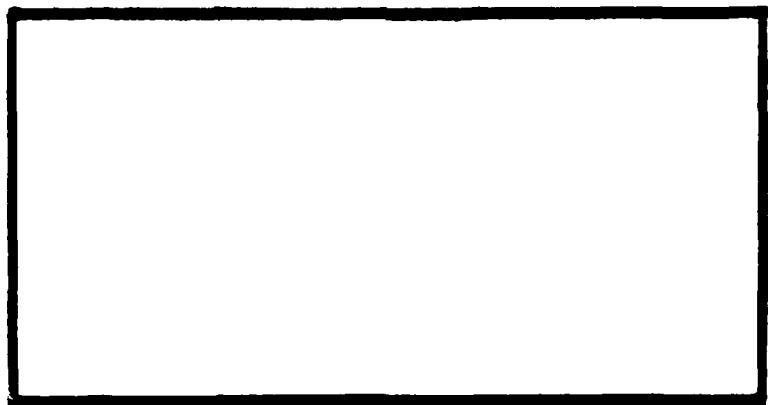
DTIC
ELECTE
NOV 0 1984
D
E

DEPARTMENT OF THE AIR FORCE

AIR UNIVERSITY

AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

84   10   31   020

2

DETERMINATION OF TRAINING REQUIREMENTS
FOR NEW LOGISTICS SUPPORT ANALYSIS
MANAGERS USING INSTRUCTIONAL
SYSTEMS DEVELOPMENT

THESIS

Gary L. Davis   Roger D. Edwards
Captain, USAF   Captain, USAF

AFIT/GLM/LSM/84S-12

Approved for public release; distribution unlimited

The contents of the document are technically accurate, and no
sensitive items, detrimental ideas, or deleterious informa-
tion are contained therein. Furthermore, the views expressed
in the document are those of the author(s) and do not necessarily
reflect the views of the School of Systems and Logistics, the
Air University, the United States Air Force, or the Department
of Defense.

X

A-1

DETERMINATION OF TRAINING REQUIREMENTS FOR NEW

LOGISTICS SUPPORT ANALYSIS MANAGERS USING

INSTRUCTIONAL SYSTEMS DEVELOPMENT

THESIS

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the

Requirements for the Degree of

Master of Science in Logistics Management

Gary L. Davis, B.S.   Roger D. Edwards, B.S.

Captain, USAF   Captain, USAF

September 1984

Preface

The purpose of this study was to determine the training requirements for newly appointed Logistics Support Analysis (LSA) managers in Air Force System Program Offices (SPOs). A secondary objective was to analyze the applicability of Instructional Systems Development (ISD) to developing training programs for managerial positions.

To accomplish the first two steps of the ISD process, we interviewed 36 people that are currently performing LSA management. During the interviews, we collected data on the knowledge and skills required to adequately perform LSA and also on which knowledge and skills the individuals possessed when assigned to perform LSA management. By comparing the two lists, we determined the areas in which the individuals required training. During the interviews, we also asked the interviewees what they thought should be included in an LSA training course.

The applicability of the ISD process was analyzed by using the authors' views of how well ISD aided them in their determination of training requirements.

We could not have performed the research nor written this thesis without the help of many individuals, too many to mention them all. However, there are a few we must recognize. We are deeply indebted to our advisor, Dr. William Askren, for his continued support throughout our effort. We also wish to thank our faculty readers, Major

Contents

List of Figures

List of Tables

AFIT/GLM/LSM/84S-12

Abstract

This study used the first two steps of the
Instructional Systems Development (ISD) process to determine
the training requirements of new managers of Logistics
Support Analysis (LSA) in Air Force System Program Offices.
Thirty-six structured interviews were conducted in person
and by telephone to gather the data.

The data analysis identified 25 knowledge and skill
areas important to LSA management. It also indicated that
new LSA managers generally lacked experience or ability in
at least 70 percent of these areas. Only 8 of these areas
were identified as areas where some new LSA managers have
any experience or skill. The analysis also indicated a lack
of adequate training on the Air Force LSA program.

The results of this study indicate a need for
persons appointed as LSA managers to have stronger technical
backgrounds. It also identifies the need for a course on
LSA. The study indicates the basic background requirements
for LSA managers and makes recommendations for improving the
Air Force LSA training program.

DETERMINATION OF TRAINING REQUIREMENTS FOR NEW LOGISTICS SUPPORT ANALYSIS MANAGERS USING INSTRUCTIONAL SYSTEMS DEVELOPMENT

I. Problem Statement

Introduction

Logistics support costs have been estimated as comprising two-thirds of the total life cycle costs of a system. In fact, operational costs often exceed acquisition costs before the system is seven years old (19:23). For this reason, more and more emphasis is being placed on addressing logistics support early in the acquisition process to identify logistics considerations in system designnctions and logistics support requirements. The analyst must be able to project the system into the future and be able to put that projection on paper. This person "must be analytically inclined and possess the ability to write." The systems analystics Support Analysis (LSA). Logistics Support Analysis is defined by Military Standard 1388-1A as:

> The selective application of scientific and engineering efforts undertaken during the acquisition process, as part of the system engineering and design process, to assist in complying with supportability and other ILS objectives [14:4].

The Air Force began emphasizing the use of LSA in 1978. This was done to more fully integrate consideration of logistics support costs into the acquisition process.

General Problem

Logistics Support Analysis is a technical methodology used to achieve Integrated Logistics Support (ILS). Integrated Logisitics Support is defined as "a composite of all the support considerations necessary to assure the effective and economical support of a system for its life cycle [12:10]." LSA, then, is an inherent part of the overall systems engineering effort to be applied throughout design and development. Plata and Spinner indicate that to properly control an LSA program, a manager should be appointed who is responsible for all matters relating to the LSA process (19:24). This is, in fact, what is done within Air Force program offices.

Hull and Lockhart, in their research, identified "the failure to employ appropriately skilled logisticians" as one of three major barriers to the full implementation of ILS (12:70). These barriers were identified by managers in the Air Force Acquisition Logistics Center (AFALC) and the Aeronautical Systems Division (ASD) of the Air Force Systems Command (AFSC). Knox and Thede found that many managers of LSA in ASD had not received any formal LSA training (14:48, 49). However, the individuals felt training would be beneficial. Almost half of the individuals that had received training felt certain areas required more emphasis.

In addition, Air Force Systems Command (AFSC) has recognized the need to provide training for LSA managers and

has requested that the Air Force Institute of Technology develop a training course for this purpose (24:1).

Specific Problem

A need, then, exists to identify the training requirements necessary for individuals assigned to perform LSA management. These requirements can then be used to determine what subjects should be included in a course of instruction for managers of LSA.

Research Questions

The primary objective of this research was to identify the training requirements for managers of LSA. These training requirements were defined as the knowledge and skills necessary to manage an LSA program that a newly appointed manager of LSA may lack. To identify these requirements, the following research questions were posed:

(1) What knowledge and skills are required to adequately perform LSA management?

(2) What required knowledge and skills did the typical individual performing LSA management have at the time of assignment to these duties?

(3) On what knowledge and skills do new managers of LSA require training?

A secondary objective of this research was to determine the usefulness of the Instructional Systems Development (ISD) methodology in answering these questions. ISD has been

3

used extensively to develop technical training courses.
However, its use in developing management courses that do
not award Air Force Specialty Codes (AFSCs) has been more
limited. Thus, to evaluate ISD applicabilty to management
course development, a fourth research question was posed:

(4) Is the ISD methodology a valid procedure for
determining the knowledge and skills required for LSA
managers?

II. Literature Review

<u>Introduction</u>

<u>Logistics</u> <u>and</u> <u>Logistics</u> <u>Support</u> <u>Analysis</u>. Since LSA
is an analytical tool used to help define logistics support
requirements, it involves using various analytical tech-
niques to solve different types of problems. It is applied
throughout system design and can include maintenance analy-
sis, life-cycle cost analysis, logistics modeling, reliabil-
ity analysis, simulation, linear programming, and other sim-
ilar techniques (3:14,138). To properly perform LSA and
apply the correct analytical technique to the problem
requires both experience and education. In fact, Blanchard
believes that good LSA requires a combination of maintenance
analysts and systems analysts (3:341).

A review of the literature on LSA has revealed a
lack of extensive writing on this particular subject. Mater-
ial discussing training or educational requirements is even
more limited. The majority of the literature discusses LSA
as a process, indicating its usefulness and the benefits
derived from employing it in system design. The manager of
LSA, however, is involved in every aspect of logistics sup-
port requirements. Educated and experienced professional
logisticians are needed to manage the logistics aspects of
system design, including LSA.

Scope and Content of the Literature Review. This
review, therefore, has been expanded to include literature
pertaining to educational requirements for logisticians.
Sources include AFIT theses, Air Force and commercial logis-
tics management journals, government reports, a report of
the Third Annual Logistics Educational Symposium, and a text
on logistics engineering and management. It will briefly
review the required skills of a logistician and those needed
for LSA, some of the problems associated with acquiring
these skills, what the educational background of a logisti-
cian should be, and whether experience is an important fac-
tor in logistics skills and LSA management. The review
focuses on opinions of both military and civilian profes-
sional logisticians working in educational and industrial
environments and is oriented toward Department of Defense
(DOD) logistics considerations. Much of the literature, par-
ticularly that pertaining to LSA, has been authored by indi-
viduals working in the defense industry.

Education and Experience Requirements

        Skills Needed. Military requirements are continu-
ously changing to meet new threats. Recent emphasis has been
on the ability to fight and be highly mobile. Davis stated
that "Our day-to-day perspective must emphasize warfighting:
management efficiency should be a secondary goal [4:4]."
The logistician must also be able "to address the ideas and

6

capabilities needed to provide warfighting support at the turn of the century [4:3]."

The skills needed to manage large, complex systems are many. Hull and Lockhart found disagreement in AFALC and ASD on just what skills are required:

> There is a difference in perspective on the types of skills required . . . . One argument is for specialists, time phased to the acquisition cycles. The other argument is for ILS generalists, who can operate through all the acquisition cycles [12:22].

Air Force Systems Command, in a study done by Mr. Donald Gragg, found that 32 percent of 613 Air Force logistics officers performed generalized work. This was by far the largest cluster of eight different types of work Gragg classified. In addition, the "general cluster shows highly generalist characteristics in number and scatter of tasks, in similarity to the whole group, and in work overlap with the other groups [1:12]."

Mazer strongly feels that general skills will be important in the future:

> Logistics managers in the 1980's will be conversant with the total spectrum of economic statistics, cost analysis, human engineering disciplines and taxation. He must further be knowledgeable in the field of total environment, local technical support to industry, local personnel sources and training, the total transportation matrixes, information data systems and maintenance of physical plant facilities . . . .
>
> The logistics generalist to support industry is a must for the 1980's [10:12].

In interviews conducted by Hull and Lockhart for their research, personnel in ASD and AFALC commented that a

logistician needed conceptual skills, analytical support skills, and the ability to use a systems approach (12:112-116). Some personnel, however, saw skills as less important than long tenure on a project, field experience, and a willingness to work.

For LSA, Blanchard has identified specific skills he feels are necessary (3:341). The maintenance analyst needs to be able to apply prediction and analysis techniques to determine maintenance functions and logistics support requirements. The analyst must be able to project the system into the future and be able to put that projection on paper. This person "must be analytically inclined and possess the ability to write." The systems analysis specialist, who aids in conducting trade-off studies and evaluation of alternatives, needs a "good background in mathematics, statistics, modeling techniques, and computer applications." This person should be able to use analytical techniques to simulate an operational situation.

Problems in Education

The logistics community agrees that a logistician needs a strong educational background. Some logisticians have realized that:

> . . . the lack of academic background often limits his ability to perform management tasks . . . . He does not really understand a number of the concepts and theories he encounters daily [16:27].

8

The Department of Defense has recognized this problem and in DOD Directive 5000.39, issued in 1980, "directs all DOD components to establish career fields and career development programs (including formal training) for ILS managers [10:11]." In an earlier step to improve the academic background of some DOD logisticians, an Acquisition Logistics program of study was implemented at the Air Force Institute of Technology in 1977. This program

> . . . is designed to produce a graduate familiar
> with the DOD acquisition process and the interre-
> lationships between decisions made in the early
> stages of an acquisition and their ultimate
> effects on the total cost of ownership. The gradu-
> ate will be skilled in advanced quantitative tech-
> niques of cost estimation, life cycle costing, and
> reliability, maintainability, and availability
> assessment [10:10].

However, many of the other colleges and universities that offer graduate programs in logistics apparently have not adjusted their programs to meet the perceived educational void. Although their programs include many areas of logistics, they are not adequately addressing the entire spectrum (10:12; 5:32). Dempsey and Lancioni feel that:

> Most business logistics curricula are heavily ori-
> ented toward the outward flow of finished goods,
> particularly consumer goods. To some extent, know-
> ledge gained in a consumer goods orientation . . .
> can be transferred to the nonconsumer goods envi-
> ronment. Yet there are gaps unfilled in such areas
> as procurement/purchasing, contract management,
> integrated logistics support, materials manage-
> ment, maintenance planning, etc. [5:33].

Stewart recognized another area that seemed to be lacking in most educational programs (22:42). That is the ability of logisticians to handle data. "Their capability to

validate, interpret and utilize it could be greatly enhanced through better formal training." One of the basic thrusts of LSA is to compile a large data base and continue to update the data throughout the LSA process. The data is used to develop maintenance procedures, training programs, identify special equipment needs and spare parts requirements, and provide information for computer modeling and trade-off studies. The ability to handle this data is important to the LSA process (18:19).

Knox and Thede found, in their research, that many individuals responsible for LSA perceived a definite lack of needed training (14:52-54, 81). However, they did not specifically identify subject areas for training. Those that had received some formal LSA training felt some areas were underemphasized. These areas included how to tailor LSA to program needs, data evaluation, cost trade-off analysis, and some specific requirements for documenting LSA data.

Educational Requirements

A graduate of a logistics program needs a broad base in both technical and managerial applications. Harrison stated that Dr. Werner Von Braun said that "logistics is a demanding field with a strong technical and managerial chal-lenge [10:11]." Harrison also cited Dr. Richard A. Web-ster, Executive Assistant to the Vice President, Westing-house Defense Group, as stating that logistics managers gen-erally are technically competent, usually having degrees in

engineering and experience in a technical field, but they
lack the capability to cope with budgets, financial state-
ments, long-range planning and similar managerial activi-
ties. Dr. Webster saw a critical need for "educational pro-
grams which relate business management needs to operational
logistics problems [10:11]." Harrison also quoted Mr. R.
L. Hale, General Manager, ILS Division, Westinghouse Elec-
tric Corporation, as saying:

> . . . industry, particularly defense industries, has
> a requirement for formal logistics degree programs:
> the type of program required being a combination or
> integration of business logistics and engineering
> logistics [10:11].

One of the problems with determining what skills are
needed by the logistician has been the "inability to specif-
ically define what is meant by logistics [20:46]."
Although a definition may be difficult, experienced logisti-
cians know that certain knowledge and skills are needed. The
Society of Logistics Engineers has identified four areas a
logistician must be knowledgeable in to be certified as a
professional logistician: Systems Management, System Design
and Development, Acquisition and Production Support, and
Distribution and Customer Support (10:12). Even more
specific areas have been identified by some logisticians as
necessary in a logistics curriculum. They feel that "college
graduates need more courses covering specific logistics or
logistics related content [5:32]." The "use of modern
analytical and management science techniques" is needed to
manage large systems (11:19). A logistics curriculum should

11

"provide course material in computer theory, man-machine systems design, and computer programming systems [20:47]." It should also include a "sound formal education in the systems approach to problem formulation and solution [22:42]," and insure that graduates are "trained in methods of operations research, systems analysis, theory of engineering design, statistics and probability, modeling and simulation [2:19]." Because, as a major cost factor, logistics is being incorporated into design, Stewart saw increased interaction between engineers and logisticians. He felt that "solid training in engineering design to improve the communications effectiveness between these disciplines" was needed (22:42). He also saw a need for "much greater variety and depth of training in mathematical methods [22:42]."

Kline (13:37,39) proposed an educational program he felt would be a major step in identifying a meaningful curriculum for logisticians. It would "consist of core courses and three areas of specialization: Support Management, Logistics Engineering, and Logistics Operation." The core courses would provide a mutual basis for all logisticians and the specialized courses would develop expertise in one of these three areas. The reader is referred to the cited reference, page 40, for a complete list of his proposal.

Some colleges and universities have developed curricula to try to meet the changing needs in logistics education. Sacramento Air Logistics Center, "in cooperation with

California State University at Sacramento and area community colleges," has developed a program to offer educational opportunities to its civilian employees (16:27). General management, identified as the primary need, includes "courses in personnel management, finance, accounting, organizational behavior, statistics, management information systems, economics, and mathematical analysis." Logistics management, the secondary requirement, applied the basic concepts of the above courses to " the specific areas of maintenance, distribution, material management, logistics plans, and logistics policy." Another university that updated its curriculum was Ohio State University. Its program was divided into four areas: functional, analytical, technical/design, and concept integration. La Londe indicated that:

> One of the major thrusts in the revision of our program is essentially moving from a functional orientation . . . to an integrative form where we are trying to focus on better interaction among the parts, a better, more total type of managerial decision orientation [15:23].

Whatever a logistics educational program offers, it should focus more on the entire logistics spectrum, emphasizing integration of managerial and technical skills, and developing a broad management perspective (5:33; 21:37).

Experience Factor

Experience is also a very significant factor in developing the ability to deal with the broad spectrum of logistics.

13

One must not only have good insight, but a way of
implementing the insight. Thus, we must have a
combination of the appropriate formal educational
background and the acquired logistics knowledge
[9:50].

Henn also supported this contention:

. . . extensive responsible experience and study
are necessary to acquire and update professional
ability . . . . Experience and knowledge of the
broad spectrum of logistics and how all the pieces
fit together is what qualifies a person to perform
intelligent logistics analysis and planning, or
manage complex logistics operations. Synthesis of
interrelated functions is the heart of the logis-
tics profession [11:19].

Henn also felt that knowing how to apply the know-

ledge one had, even if it was not extensive, was more impor-

tant than having extensive knowledge that one applied

wrongly or could not apply at all.

Logistics employment opportunities may also depend

on what experience the individual has had as "companies rely

heavily on working experience as preparation for logistics

management positions [21:41]." However, for government

employees, "there has been no clear evidence that logistics

education has been a strong factor in managerial promotion

[16:27]."

Senior logisticians in ASD and AFALC "felt strongly

the lack of any type of relevant experience or skill" was a

significant barrier in implementing ILS. AFALC identified

both systems and logistics experience as important personnel

capabilities (12:114).

Blanchard has indicated that the ability to review

and evaluate design data and determine maintenance functions

and logistics support requirements is important to LSA
(3:341). He believes this is best accomplished by individ-
uals who have experience in equipment maintenance and are
thoroughly familiar with operational and maintenance proce-
dures, organization structure, maintenance levels, and
environmental conditions.

Summary

Only recently has it been recognized that logistics
support costs are a major portion of the total life cycle
cost of a system. Skilled logisticians who can use such
tools as LSA effectively are needed early in the acquisi-
tion process in order to help reduce these costs. However,
there is some contention as to whether logistics specialists
are needed or a logistics generalist is required.

A logistician needs a solid formal education to help
develop the many necessary skills needed to manage large,
complex systems. Although a few programs exist, such as the
one at AFIT, professional logisticians perceive a problem in
adequate educational programs. Most curricula are not
designed to meet the whole concept of logistics and gradu-
ates do not receive adequate educational background. In
addition, formal LSA training does not appear to convey ade-
quate knowledge about LSA management.

Logistics curricula need to be changed to tie
together all of the pieces of logistics and emphasize its
total spectrum. Areas such as engineering design, analytical

techniques, systems theory, computers, and management science techniques need stronger emphasis. The entire curriculum must strive to integrate technical and managerial skills.

Although formal education provides a solid background on which to build, experience is needed to be able to effectively manage complex systems. Commercial industry relies heavily on experience when considering promotion to logistics management positions. Professional logisticians agree that experience is an important factor in a logistician becoming an effective manager.

Relationship of Literature to Research

The literature has indicated what professional and experienced logisticians perceive as necessary educational background for a capable logistician. It also listed many skills considered necessary for a person to effectively manage ILS and LSA. From the literature, a list of knowledge and skill requirements was developed to use as a reference during the research process.

III. **Methodology**

Research Strategy

        In order tr accomplish the objectives of this

research, the methodology of Instructional Systems Develop-

ment (ISD) was applied. Air Force policy directs the use of

the ISD process in developing courses of instruction (7:1).

The ISD process is:

        A deliberate and orderly, but flexible, process
        for planning and developing instructional programs
        which ensure that personnel are taught in a cost
        effective way the knowledges, skills, and atti-
        tudes essential for successful job performance
        [6:A1-3].

The complete ISD process requires five steps (see figure 1):

        1.   Analyze system requirements.

        2.   Define education/training requirements.

        3.   Develop training objectives and tests.

        4.   Plan, develop, and validate instruction.

        5.   Conduct and evaluate instruction.
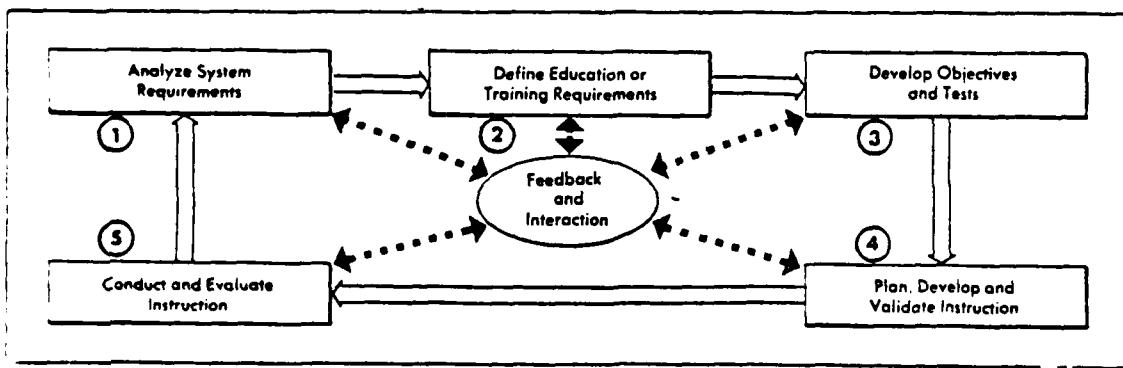
Figure 1.   Instructional Systems Development (8:11-2)

17

The primary objective of our research was to answer the following research questions and determine the training requirements for managers of LSA:

1. What knowledge and skills are required to adequately perform LSA management?

2. What required knowledge and skills did the typical individual performing LSA management have at the time of assignment to these duties?

3. On what knowledge and skills do new managers of LSA require training?

To do so we applied the ISD methodology through step two. However, AFR 50-8 indicates that "ISD must start when a new weapon or support system is in the conceptual stage" to analyze the requirements of the system (7:1). This is the ideal approach of step one in the ISD process and would be completed on a new system to develop initial skill training. Since LSA is a support system already in use, our approach was to modify the requirements of step one and was limited to compiling a list of job duties. AFM 50-62 states that the ISD process may "be altered to accomodate particular training programs without violating the basic system [8:11-2]."

The secondary objective of our research was to see how well we could apply this methodology in defining training requirements for managers of LSA and thus answer the following question:

18

4. Is the ISD methodology a valid procedure for deter-
mining the knowledge and skills required for LSA
managers?

The ISD process was applied using a structured
interview approach. An interview guide was used when
conducting the interviews. The interviews were used to col-
lect data from personnel managing LSA on what duties are
performed in LSA management, what knowledge and skills are
required to perform these duties, and what knowledge and
skills were possessed when initially given the job of LSA
management. The researchers felt the interview technique to
be the best approach to collect data because:

1. "The interview method is quite good when used with a
checklist or questionnaire [6:2-4]."

2. Approximately 60% of the population of interest are
located at Wright-Patterson AFB in very close prox-
imity to the researchers.

3. Subjects would provide more information in an inter-
view since verbalizing is easier than writing
answers.

4. Subjects would spend more time and researchers could
elicit a better response with an interview. Confu-
sion could be eliminated during the interview and
any questions the subject had concerning the topic
could be answered.

5. Subjects would be more willing to respond to per-
sonal contact than to a mail survey.

6. A mail survey limits the scope of the topic.
    Follow-up questions, as necessary, can be used in an
    interview.

7. Interviews provide the researchers with a better
    understanding of the subject's comments.

Instrument

The data collection instrument used was a structured
interview guide. The guide was developed to be a general
guide to the interview and allow for expansion on the topics
covered. Initially, some biographic information on the sub-
ject was recorded and then three general topics were covered
to gather data to answer the research questions. The instru-
ment is included as Appendix A.

The biographic information was collected to estab-
lish the subject's eligibility for participation in the
research and to assist the researchers in determining if
there is a common background among LSA managers. In addi-
tion, the fourth area of the guide expanded on the knowledge
and skill background of the subjects. This assisted the
researchers in determining the training requirements for the
majority of LSA managers and could assist course designers
in deciding if all training needs should be met. This was an
attempt to define the "typical" LSA manager.

The job duties portion was used to discuss duties
performed by the subject during the course of LSA management
activities. The subject was asked to describe specific

tasks, related to LSA management, that the individual per-
formed. This could have included daily, weekly, or more
infrequent tasks as well as one-time tasks of significance.
In addition, the subject was asked to rate each duty
described in terms of criticality of the task to LSA manage-
ment, learning difficulty of the task, and frequency of task
performance. The rating was done on a numerical scale (see
Appendix A, Section II). An explanation of the scales was
given to the interviewee before specific job duties were
discussed.

The list of knowledge and skills in part three of
the instrument is a list the researchers developed from the
literature review and from initial discussions with person-
nel in AFALC/PTA. It was not intended to be all inclusive
and the subject was encouraged to add to or subtract from it
as desired.

The fifth and final section was used to allow the
subject to express an opinion on what training LSA managers
need and to act as a final probe to assist the subject in
recalling or remembering useful information that may not
have been discussed during the interview.

The researchers pretested the instrument to deter-
mine its usefulness. This was done by conducting an inter-
view and modifying the guide as necessary to conduct as
smooth an interview as possible. This process was followed
three times before the researchers felt the guide was ready
for actual data collection.

In addition, after the researchers decided on the
final form of the interview guide, Dr. Askren, Chief, Acqui-
sition Logistics Branch, Logistics and Human Resources Labo-
ratory, Wright-Patterson Air Force Base and Major Babiarz,
Assistant Professor of Logistics Management, Air Force
Institute of Technology, Wright-Patterson Air Force Base,
each reviewed the guide for content validity and approved
its usefulness. Dr. Askren has over 20 years experience con-
ducting research for the Air Force in the areas of human
factors, system design, maintenance, and logistics. He has a
PhD in Industrial Psychology and an AB in Mathematics. Major
Babiarz has been a professor at AFIT for three years. He
spent four years as a logistics officer in the F-16 System
Program Office, one and one-half of them as assistant to the
Deputy Program Manager for Logistics. He has a BS in both
Industrial Engineering and Logistics Management and an MA in
Industrial Management.

Population/Sample Selection

Population. The population for this study was deter-
mined to be those personnel who were responsible for the
management of LSA, or the LSA focal point, within the var-
ious Air Force System Program Offices (SPOs). The two major
locations of the population considered are Wright-Patterson
AFB, Ohio and Hanscom Field, Massachusetts. From these two
locations, lists of 93 and 133 separate programs,
respectively, were obtained. Although exact numbers were

impossible to determine, the researchers obtained
information with accurate estimates that approximately 60
persons at Wright-Patterson AFB and 25 at Hanscom Field were
performing duties as LSA focal points. Some programs are
small and one person may have LSA management responsibility
for several programs or as an additional duty. Large
programs generally have one LSA focal point. Four other
locations were included in the population and names of
individuals performing LSA management duties were obtained.
These included seven people at Los Angeles AFS, seven at
Norton AFB, four at Eglin AFB, and five at Griffis AFB.

Sample Selection. The population was stratified into
three groups: 1) Wright-Patterson AFB, 2) Hanscom Field, and
3) all the others. The researchers selected a sample size of
45 in considering time constraints and the desire for a
large sample. A requirement to collect data from 30 inter-
views was specified as a minimum desirable sample size. From
the three groups, 56 percent of the sample would come from
Wright-Patterson AFB, 23 percent from Hanscom, and 21 per-
cent from the rest. This correlates to the population divi-
sion by groups and resulted in sample sizes of 25 from group
1, 10 from group 2, and 10 from group 3. A random number
generator was used to select the sample from each group. The
lists of programs obtained from Wright-Patterson AFB and
Hanscom Field were already sequentially numbered. A list of
random numbers from 1 to 93 was generated for the Wright-
Patterson group. Then a second list from 1 to 133 was gen-

erated for Hanscom Field. A different random number seed was
used for each list. The program number associated with the
first random number generated was then contacted to arrange
an interview with the LSA focal point. Contact continued
down each list until the required number of interviews had
been arranged. This approach was used for several reasons:
1) since it was impossible to determine the exact number of
the population at these two locations, each program had an
equal opportunity for selection; 2) since one person may be
responsible for more than one program, some duplication was
expected to occur before the necessary sample size was
reached; 3) it was apparent from initial discussions with
contacts at these locations that much of the population
spends an inordinate amount of time performing temporary
duty (TDY) and may be difficult to contact for an interview.
Sample selection from the third group followed the same pro-
cedure, with random numbers from 1 to 23 first being
assigned to names.

Data Collection Plan

        Two types of interviews were used to collect the
data, in person and telephone. Interviews on Wright-Patter-
son AFB were accomplished in person. Even though Hanscom
Field has a relatively large sample in one location, the TDY
commitments of the sample population, some performed on
extremely short notice, precluded the assurance that per-
sonal contact with all the sample could be made by the

24

researchers in one reasonably short visit. Therefore, due to time and travel limitations, group two as well as group three interviews were conducted by telephone. For the interviews conducted on Wright-Patterson AFB, the subject was contacted by telephone to arrange the interview. A brief summary of what the researchers were attempting was presented and a time for the interview arranged. The researchers had determined that it would prove advantageous for the subjects interviewed by telephone to have a copy of the interview guide ahead of time. Thus, if the subject agreed to the interview, a copy was mailed to him/her to arrive before the actual interview. Ample mail time was allowed between initial contact and the actual interview. To maintain consistency, a copy of the guideline was also provided to subjects on Wright-Patterson AFB at least two to three days prior to the actual interview.

Each interview lasted approximately 60 to 90 minutes. A more thorough explanation of the purpose of the research and why the interviewee's comments were being sought opened the interview. It was explained that the interviewee could remain anonymous. The interview then pro-ceeded according to the general outline on the interview guide and all relevant comments made by the subject were recorded by the researchers as the interview progressed.

Assumptions and Limitations

Certain assumptions and limitations apply to this research and are recognized as follows:

1. Assumptions

    a. Interviewees were willing to give accurate answers.

    b. Interviews by phone provided the same information as those conducted in person.

2. Limitations

    a. The number of interviews conducted was limited by time.

    b. The data collected is on the ordinal scale and only nonparametric tests could be used for analysis.

IV. Findings

Introduction

The findings are addressed in the order that the analysis was done. First, the composition and demographic data of the sample population is presented and the authors describe a "typical" LSA manager. Then, the authors present the analysis of the data as it applies to each research question.

All interviews from group one were completed first. Then groups two and three were completed. The data collection period began 16 March 1984 and ended 13 July 1984. As expected, the researchers encountered considerable difficulty in arranging some interviews, particularly those by telephone. This was primarily due to the TDY commitments of the subjects. In addition, since LSA has only recently received increased emphasis, several offices responsible for older contracts were not involved in LSA, as LSA was not included as a requirement in their contracts. This combined with the TDY effect on arranging interviews resulted in an actual sample size of 36, 9 below the target of 45, but well above the minimum acceptable of 30.

The researchers made no attempt to verify any of the data given in the interviews, and used it as given for their analysis. In analyzing the data collected in sections II through V of the interview guide, the researchers chose a limit such that if any item was not mentioned by at least 20

27

percent of the interviewees, it would not be included in the analysis. Thus an item must have been mentioned by at least 8 interviewees to be included in the analysis. This would eliminate one-of-a-kind, program specific, and/or office specific items that generally did not appear to be relatively common to the field of LSA management. Although this limit was somewhat arbitrarily chosen, the researchers agreed that any item that did not meet this criteria was not significant to the research.

Sample Composition and Demographic Data

The researchers conducted interviews with LSA managers in Air Force System Program Offices. A total of 22 were completed in-person on Wright-Patterson AFB (Group I). Telephone interviews included 9 at Hanscom AFB (Group II), and 2 at Eglin AFB, 2 at Griffis AFB, and 1 at Norton AFB (all Group III). No one was available for a telephone interview at Los Angeles AFS. This resulted in a sample division of 61 percent for Group I, 25 percent for Group II, and 14 percent for Group III. This reasonably correlates with the sample division estimate presented in Chapter 3.

Section I of the interview guide was used to collect the demographic data. The purpose of this section was to assist the researchers in determining if there was any common background among LSA managers and to try to describe a "typical" LSA manager. A summary of this data is presented

in Table I, showing the number of interviewees in each category.

From this information, the researchers have described a "typical" LSA manager as a GS-12, Logistics Management Specialist, civilian job series 346. The LSA Managers generally have at least a Bachelor's degree and have been to some AFIT continuing education courses that have some applicability to LSA management. The individuals have generally been working at their present jobs for a little over two years and have about two years eight months of relevant LSA experience. They believe they spend a little more than one-fourth of their time performing LSA management responsibilities.

Research Question 1

The first research question is: What knowledge and skills are required to adequately perform LSA management? To answer this question, the researchers analyzed the data gathered in sections II and III of the interview guide. A list of 11 job duties was compiled from the information gathered in section II and is summarized in Table II. The table shows the number and percent of interviewees that indicated they performed the duty listed.

Table I

Summary of Demographic Data

Rank/GS Rating:	1 Lt	Cpt	Maj	GS-9	GS-11	GS-12	GS-13	GM-13
	2	3	2	1	4	20	3	1

AFSC/Civ Series:		AFSC					Civilian Series		
	2724	2816	2825	4024	6624	0346	1670	2001	6624
	1	2	1	1	2	26	1	1	1

Job Title:				Acquisition	Lead Logistician/
DPML[a]	ILSM[b]	Log Mgt Spec	Logistics Mgr	ILS Division Chief
3	8	20	2	2

Education/Training

Degree:	None	Assoc.	BA	BS	MA	MS
	10	3	3	9	3	8

AFIT Continuing
Education Courses:	None	SYS100[c]	SYS2L.	LOG220	LOG224
	9	7	1	10	9

	LOG225	SYS228	SYS230	SYS260	QMT353
	11	1	1	6	1

Army Logistics Support Analysis Course: 7.

PME: Air Command and Staff College – 5
       Squadron Officer's School   –   8

EXPERIENCE
LSA –   range: 0 to 144 months
        avg: 32.056 months
        std dev: 33.133 months

Time at Present Job – range: 3 to 66 months
                      avg: 23.111 months
                      std dev: 17.409 months

Percent Time Spent Performing LSA Duties – range: 0 to 100
                                           avg: 29.944
                                           std dev: 30.463

[a] DPML – Deputy Program Manager for Logistics
[b] ILSM – Integrated Logistics Support Manager
[c] See Appendix B for the AFIT course titles

Table II

Job Duties

	Number	Percent
1. Provide LSA inputs to Statement of Work (SOW)	30	83.3
2. Review LSA data output summaries	28	77.8
3. Conduct/attend Review Conferences on contractor progress	26	72.2
4. Review and evaluate contractor's LSA Plan	22	61.1
5. Provide LSA inputs to Contract Data Requirements List (CDRL)	21	58.3
6. Coordinate/review LSA requirements and/or progress with other offices(Program Manager, engineers, users, contractor, Air Logistics Centers)	20	55.6
7. Conduct LSA Guidance Conference	18	50.0
8. Tailor LSA requirements to the program	17	47.2
9. Evaluate LSA proposals for source selection	16	44.4
10. Complete/provide inputs to Data Sheet A	9	25.0
11. Develop and implement provisioning requirements for program	9	25.0

Three of the job duties require further explanation.
Job duty two includes reviewing the LSA Record (LSAR) and
also reviewing summary reports, reliability and
maintainability data, provisioning data, and other related
information. Problems and questions that arise are
coordinated with the appropriate offices and resolved with

the contractor. This review is also used to insure that the contractor is meeting the LSA requirements of the contract. Concerning job three, some interviewees indicated that they conducted reviews to specifically evaluate LSA while most said LSA was included as a review area during quarterly review conferences. Job duty six not only included periodic coordination on LSA problems and/or review of contractor performance on LSA requirements, but each person listing this as a duty indicated that a major problem was convincing Program Managers (PMs) and engineers of the value of LSA and what it could do for them. They indicated that the success of LSA and the emphasis placed on its use often depended on their ability to "sell" PMs and engineers on its advantages. Other interviewees also indicated this as a problem although they did not list it as a specific duty.

It is interesting to note the wide variation in the percentage of persons (83.3 to 25.0) who reported the various job duties. The researchers feel that much of this variation is due to the following factors:

1. Some interviewees were more detailed than others when listing their job duties.

2. Most interviewees had not managed LSA through a completed contract. Some contracts were just beginning while some individuals had assumed LSA management duties at various stages of the contracting process. This led to unfamiliarity with exactly what

duties were required during the entire contracting process.

3. Not every contract requires all of these duties to be done.

The researchers made no attempt to prompt the interviewees to help them to recall or mention specific duties other that to provide them with an example to clarify the type of information requested.

AFM 50-2 states that criticality, frequency of performance, and learning difficulty are some of the factors to consider in determining training requirements (6:3-1). Each interviewee was asked to rate each job duty listed according to the scales in section II of the interview guide (see Appendix A). This data is summarized in Table III. The job duties correspond to those listed in Table II. The Table indicates the average rating given by the interviewees to each of these areas. The actual ratings given corresponded to the scales in Appendix A, section II, page 53.

The researchers used the data on criticality to try to determine if there were any routine, non-critical duties performed by LSA managers. These duties would then be candidates for exclusion from a training course, particularly if training time were a limiting factor. Although there was some variation between interviewees on the ratings given each duty, most interviewees considered every duty to be at least critical to the successful management of LSA. Data on the amount of training needed was used to try to determine

Table III

Training Requirement Considerations

Duty	Criticality[a] Average Rating	Amount of[b] Training Average Rating	Frequency[c] Average Rating
1. SOW	4.04	4.54	5.04
2. Review Output	3.85	4.42	3.74
3. Review Confer.	3.21	4.17	3.89
4. Review LSA Plan	3.50	4.50	4.25
5. CDRL	3.89	4.61	4.94
6. Coordinate LSA	3.64	4.44	3.90
7. Tailoring	4.31	5.18	4.73
8. Guidance Conf.	2.82	4.39	5.25
9. Source Select.	4.00	4.23	4.77
10. A Data Sheet	4.25	4.50	5.00
11. Provisioning	4.17	6.20	3.40

[a] 1 = Noncritical; 5 = Extremely Critical
[b] 1 = None; 7 = More than a month
[c] 1 = At least daily; 7 = Less often than once a year

the learning difficulty of each duty and how much training
time might be required to teach it. Almost all interviewees
expressed reservations about rating the duties in this
manner because they were unsure of exactly what information
needed to be taught. The data, therefore, did not provide
the researchers with as much information as they had hoped.

However, all interviewees indicated they felt that there were no duties that a new LSA manager could perform without at least some training. The frequency of performance of the duties was primarily dependent on the number of contracts the LSA manager was responsible for. The method of assigning responsibility varied from SPO to SPO and by size of the contracts. Some LSA managers were responsible for only one contract while others had as many as 30. The frequency of performance data was used to determine how regularly a duty was performed. Some are done only once a contract, such as the SOW and CDRL. However, since all these duties are critical to a good LSA program, this may indicate tl.~ need for checklists for these duties since training could not totally compensate for the tendency to forget when there are long periods between performance. Other duties are performed on a more regular basis. The researchers did not find any duties done infrequently that were not critical to LSA.

The opinions of the interviewees on what knowledge and skills were necessary or helpful in doing LSA management was collected in section III of the interview guide. The list in section III of the guide is not finite and the researchers requested that the interviewees add to it as they felt necessary. The results are summarized in Table IV. Any of the items from the guide not appearing in the table indicates they did not meet the 20 percent response requirement established by the researchers. The table shows the

Table IV

Knowledge and Skills Needed for LSA Management

	Number (%) Responding	Number (%) Indicating Need	Number (%) Indicating Helpful
1. Technical Skills			
—Maintenance background	21 (58)	8 (22)	13 (36)
—Engineering background	10 (28)	0 (0)	10 (28)
2. Statistics	18 (50)	7 (19)	11 (31)
3. PERT	19 (53)	11 (31)	8 (22)
4. Decision Theory	16 (44)	5 (14)	11 (31)
5. Systems Management Theory	28 (78)	20 (36)	8 (22)
6. Modeling	21 (58)	8 (22)	13 (36)
7. Life Cycle Costing	29 (81)	20 (56)	9 (25)
8. Basic Computer Use Skills	27 (75)	17 (47)	11 (31)
9. Computer Simulation	8 (22)	1 (3)	7 (19)
10. Ability to read and understand technical drawings	16 (44)	3 (8)	13 (36)
11. General writing skills	34 (94)	31 (86)	3 (8)
12. Contract writing background	31 (86)	15 (42)	16 (44)
13. Specifications writing skills	15 (42)	4 (11)	11 (31)
14. Participative speaking in meetings and conferences	32 (89)	29 (81)	3 (8)
15. Give techrical briefings	22 (61)	17 (47)	5 (14)
16. Supervisory skills	12 (33)	8 (22)	4 (11)
17. AF Budget Cycle and Budget procedures	22 (61)	12 (33)	10 (28)
18. Contracting background	27 (75)	10 (28)	17 (47)
19. Technical Order System	31 (86)	20 (56)	11 (31)

Table IV (cont.)

Knowledge and Skills Needed for LSA Management

	Number(%) Responding	Number(%) Indicating Need	Number(%) Indicating Helpful
20. Understand Mean Time Between Failure(MTBF) and Mean Time To Repair (MTTR) calculations	30(83)	8(22)	22(61)
21. Understand Maintenance Deficiency/Quality Deficiency Reports	19(53)	2(6)	17(47)
22. Military Standard 1388-1A	31(86)	30(83)	1(3)
23. Safety	18(50)	6(17)	12(33)
24. Security	16(44)	9(25)	7(19)
25. Base Supply procedures	29(81)	21(58)	8(22)

number and percentage of interviewees that indicated the particular knowledge or skill level was either needed or helpful in performing their LSA duties.

The data in Table IV indicates that the interviewees felt that the most important knowledge needed by LSA managers was knowledge of Systems Management Theory, Life Cycle Costing, Technical Orders, MILSTD 1388-1A, and base supply. In addition, the interviewees felt the LSA manager must possess good writing and speaking skills. Many interviewees felt that a maintenance, engineering, or contracting background would be very helpful, but not necessary. Few of them felt a definite need for analytical skills such as

statistics, although many said these skills would be helpful. In addition, many interviewees felt it would be helpful to have a general knowledge of MTBF/MTTR calculations and how to interpret their meaning. Several interviewees also felt it would be helpful to understand Maintenance Deficiency/ Quality Deficiency reports and their procedures. Interviewees were generally evenly divided on whether computer skills and knowledge of Air Force budget procedures were needed or would be just helpful for LSA managers.

A surprise to the researchers was the definite lack of need for quantitative skills such as statistics, linear programming, and quantitative decision making tools. Almost all interviewees indicated, however, that they receive support in this area from an analysis branch or from engineers assigned to the program. In analyzing data in Tables II and IV, the researchers could not determine a need for any knowledge or skill not mentioned in Table IV. Therefore, they consider this list complete.

Research Question 2

The second research question is: What required knowledge and skills did the typical individual performing LSA management have at the time of assignment to these duties? To answer this question, the researchers asked each interviewee to list from the knowledge and skills they had indicated in section III as being important, which ones they

felt they possessed when originally assigned the duties of LSA management. The results are presented in Table V. Again the researchers applied their 20 percent rule. Thus only those knowledge or skill areas mentioned by at least 20 percent of the interviewees were considered by the researchers as being possessed by the "typical" LSA manager when first assigned to these duties.

Table V

Knowledge and Skills Possessed When Assigned
LSA Management Duties

	Those Possessing Knowledge or Skill at Assignment	
	Number	Percent
1. Writing Skills	12	33.3
2. Speaking Skills	12	33.3
3. Maintenance Background	11	30.6
4. Technical Order System	10	27.8
5. Base Supply Procedures	10	27.8
6. Systems Theory	9	25.0
7. Basic Computer Use	9	25.0
8. Understanding of MTBF/MTTR Calculations	8	22.2

Of the 25 knowledge and skill areas listed in Table IV, only 8, or 32.0 percent, were possessed by any LSA manager when

assigned LSA management duties. Of these 8 areas, only 22 to
33 percent of all LSA managers possessed any one of them.

Research Question 3

The third research question is: On what knowledge
and skills do new managers of LSA require training. To
answer this question, the researchers compared the
differences in the results of the data analysis for
questions one and two. In addition, they analyzed the data
collected in section V of the interview guide.

In comparing the results for question one with that
for question two, it was readily apparent to the researchers
that there is a significant difference between the knowledge
and skills considered important (Table IV) and those
possessed by new LSA managers (Table V). Of the 25 knowledge
and skill areas considered important for LSA management, new
LSA managers had no ability in 17, or 68 percent, of them.
These 17 areas are: statistics, PERT, decision theory,
modeling, life cycle costing, computer simulation, ability
to read and understand technical drawings, contract writing
background, specifications writing skills, give technical
briefings, supervisory skills, AF budget cycle and budget
procedures, contracting background, understanding
Maintenance Deficiency/Quality Deficiency Reports, Military
Standard 1388-1A, safety, and security. In addition, only a
few new LSA managers had any ability in the other 8 areas.
These areas are: general writing skills, participative

speaking in meetings and conferences, maintenance background, Technical Order system, Base Supply procedures, systems theory, basic computer use, and understanding of MTBF/MTTR calculations. The two areas with the greatest number possessing the skills, writing and speaking, were possessed by only 33 percent of new LSA managers while the area with the fewest number having the skill, understanding of MTBF/MTTR calculations, was only 22 percent. Thus, only 22 to 33 percent of new LSA managers may have some relevant experience or ability. This analysis would indicate that most new LSA managers require education or training in all 25 areas.

The data collected in section V of the interview guide is summarized in Table VI. The interviewees were asked. to indicate what should be included in a course on LSA for new LSA managers.

The data in Table VI indicates the primary concern of the new LSA manager is to learn what the LSA process itself really is. They feel they do not have any knowledge of LSA and need training on what LSA is, what it does, how it works, and what results it should produce.

In comparing the data analysis of questions one and two with the data analysis of section V, the results are somewhat different. This indicates that most of the knowledge and skills necessary to effectively manage LSA cannot be taught in a short course and must be obtained through experience, education, and/or technical schools.

41

However, the data from section V indicates that a course on LSA should be available to new LSA managers.

Table VI

LSA Course Subjects

	Those Indicating This Need	
	Number	Percent
1. Use of LSAR/Output Summaries: —What is needed and when —How to use to evaluate the contractor	28	77.8
2. LSA overview: —How LSA fits into the ILS process and how it affects the design	28	77.8
3. How to tailor LSA to the individual program:	26	72.2
4. MILSTD 1388-1A: —What each task requires of the contractor —What reports are generated by the task —What task is needed to accomplish a specific purpose	22	61.1
5. SOW/CDRL:	16	44.4
6. LSA product integration with ILS: —Use by and effect on other SPO divisions	15	41.7
7. LSA management problems: —Checklist of areas to watch out for —Typical problems in dealing with contractors	11	30.6
8. How to determine cost of LSA :	8	22.2
9. LSA Data Sheets:	8	22.2

Research Question 4

The fourth research question is: Is the ISD method-
ology a valid procedure for determining the knowledge and
skills required for LSA managers? The researchers
subjectively evaluated the first two steps of the ISD
process as it was being applied in this study. The relevance
of the application of these two steps to the determination
of training requirements to a management position (LSA
manager) is discussed below.

Step 1: Analyze System Requirements. As previously
discussed, AFR 50-8 states that the ISD process should start
when a new weapon or support system is in the conceptual
stage (7:1). Since LSA was already implemented, the
researchers used a modified step one. The researchers feel
that the interview technique was effective in developing a
list of job duties and knowledge and skill requirements for
LSA managers. These lists are not all inclusive due to the
time constraints on this research, but the information
developed is considered by the researchers to be valid and
applicable.

Step 2: Define Education or Training Requirements.
In applying the ISD process to data analysis, AFM 50-2
states that:

> . . . some of the factors you should consider in
> determining the instructional requirements . . .
> are: number of people who do the task, criticality
> of the task, frequency of performance, learning
> difficulty, time interval before first
> performance, and prior experience [6:3-1].

43

Analysis of the collected data was based on all of the above factors except the time interval for first performance. The researchers feel that the application of this step to their research has resulted in defining the education and training requirements for new LSA managers. The researchers feel that the procedures used in this step were effective and that the information developed using this step is a valid representation of the requirements for training new LSA managers. The remaining steps of the ISD process (Step 3: Develop Objectives and Tests; Step 4: Plan, Develop and Validate Instruction; and Step 5: Conduct and Evaluate Instruction) were not done by the researchers since they are beyond the scope of this study. They were, thus, not evaluated. However, the results of Step 2 have provided the basis for continuing with Step 3 of the ISD process.

V. Conclusions and Recommendations

In this chapter, the researchers present the conclusions they have drawn from the data analysis, some recommendations to improve the capability of LSA managers, and some recommendations for further research.

Conclusions From the Research

Primary Research Objective. Based on the analysis of the data collected from the interviews, the researchers concluded that individuals appointed to perform the duties of LSA manager generally do not have appropriate background experience to provide them with a solid base from which to build LSA experience. The most appropriate background to provide this base would be maintenance experience. However, a background in contracting, engineering, or even general logistics experience could also prove beneficial. In addition, although a college degree is not uncommon among LSA managers, their educational background lacks the technical rigor many of them feel would be helpful, since few of them had any engineering, statistical, or technical backgrounds when assigned to do LSA management. This indicates that the qualifications necessary for an LSA manager may not be defined clearly enough. This is even further emphasized from comments by many interviewees that they learned everything they know about LSA management on the job.

The interviewees' responses to what should be in a course for LSA managers indicated the need for specific training on: LSA, procedures for effectively managing LSA and its products, and assessing what impact LSA is having on the system. The fact that many interviewees indicated difficulties in convincing Program Managers and engineers of the value of LSA further supports the need for LSA training, not only for those individuals managing LSA, but also for the Program Managers and engineers.

The researchers have concluded that individuals doing LSA management are at a serious disadvantage when appointed to these duties due to the lack of an appropriate technical and/or educational background. Those who have been performing these duties for some time are doing a very cred- ible job of trying to use LSA effectively, and they have been able to learn many of the necessary skills through job experience. However, this generally applies only to individuals that have been doing LSA management for a longer period of time. In addition, they are all impeded by the lack of an adequate training program on LSA, and in some cases, by the lack of support for and understanding of LSA by Program Managers and engineers. All of these factors tend to reduce the effectiveness of LSA as an analysis technique to improve the logistics support of a system.

These factors indicate that individuals appointed to be LSA managers should have a technical background commen- surate with the system they will work with. In addition,

although many interviewees did not feel a strong quantitative background was needed, many felt it would be helpful. The researchers agree that it would be helpful, although this capability could be learned by taking specific college courses. An even more important need is a course that thoroughly explains Air Force policy and procedures for managing LSA, its advantages, and provides detailed coverage on the various steps in the LSA process.

Secondary Research Objective. Based on the data collected, the researchers feel they were successful in using the ISD methodology to determine the training requirements for LSA managers. Although the researchers only completed a portion of the entire ISD process, using a modified approach to the basic steps, they feel it was a valid method for determining the knowledge and skill requirements for LSA managers. Thus, the researchers feel that the data collected is accurate and indeed can be used to determine training requirements for LSA managers.

Recommendations for Improvement

The researchers feel that certain steps can be taken to improve the capability of new LSA managers and thus the effectiveness of the Air Force LSA program.

First is to place individuals with an appropriate technical background in the position of LSA manager. The ideal background would be an engineer with maintenance experience. However, a more realistic approach would be to

assign LSA duties to someone with maintenance experience. These individuals should be very knowledgeable of logistics considerations in field environments, providing important insight to LSA during design. The capabilities of the individual would also be enhanced if their educational background included systems theory and quantitative techniques, particularly statistics. However, if the individual lacked this background, there are AFIT Professional Continuing Education (PCE) courses that could help fill this void and provide basic knowledge for LSA management. Particularly recommended is QMT 372, Reliability, a 3 week course. In addition, there are more specialized courses such as SYS 010, Air Force Technical Order Acquisition and Management, and QMT 353, Introduction to Life Cycle.Costing, that should· prove extremely valuable to LSA managers without backgrounds in these areas.

Although 86 percent indicated writing skills were needed and 81 percent speaking skills, thus deeming them the two most important skills, only 33 percent stated they had these skills when assigned as LSA manager. Yet, none of the interviewees indicated they had taken any courses to improve these particular skills. Two PCE courses, COM 210, Technical Writing Seminar, and COM 215, Briefing Preparation and Presentation, are available to help improve these skills.

The second recommendation is that a Special Experience Identifier (SEI) be established for LSA managers. Since the job requires certain skills and experience, the person-

nel system needs to be able to identify personnel that are qualified for that job. An excellent way of doing this is the SEI. This should decrease the cases of assigning an individual who is not qualified when someone who is qualified is available.

The third recommendation is that a course on LSA be developed. This course should be designed to teach new LSA managers the basic concepts of and procedures for LSA management. Although the researchers did not do step three of the ISD process, they recommend that as a minimum, the course include instruction in the areas outlined in Table VI. Although the course must necessarily include general information on LSA, interviewees expressed a distinct need for coverage of specific Air Force procedures for LSA management. Some of the interviewees had attended the Army LSA course and, although they found it somewhat beneficial, expressed a dissatisfaction with its application to Air Force procedures. The researchers also feel that AFIT PCE course SYS 100, Introduction to Acquisition Management, provides fundamental knowledge basic to the understanding of LSA and should be considered for designation as a prerequisite to any developed LSA course. The researchers feel an LSA course would logically fit in the AFIT PCE program.

The fourth recommendation is to develop a short, one to two day course aimed at the Program Managers, engineers, and other key personnel. This course should explain the basics of LSA, why it can be effective in improving logis-

tics support, its benefits, and the value of applying it to system development. In short, a course that will "sell" LSA to these individuals and convince them of the value of making effective use of it on their program. This information could be presented as the first block of an LSA course, as a briefing, or as a separate course in itself. However, the researchers feel that whatever format would be chosen for this course, it should be one that makes this information as readily accessible as possible to all personnel who might require this type of information. The researchers feel one effective approach would be a briefing format that could be effectively presented by personnel in AFALC/PTA.

The fifth recommendation is to develop standardized checklists for LSA managers that they could use for different job duties. This especially applies to the duties that are generally done infrequently such as the SOW, CDRL, and source selection. Since the frequency of performance of duties such as these is very low for most LSA managers, they are not able to gain rapid experience. In addition, the effectiveness of any training will be decreased because of the extended time between performance. The researchers feel that checklists covering these areas would assist the LSA manager and help insure a more effective LSA program.

Recommendations for Further Research

Further research beyond this study is needed in certain areas. A determination of whether or not there are per-

sonnel available within the Air Force with the appropriate technical and/or educational background that could be assigned to LSA management duties is needed. The ISD process should be continued and completed to develop an LSA course. A third area that was not covered by this study but came to the attention of the researchers several times is the cost of LSA. Very little, if any, data exists to assist LSA managers in determining what the increase in the cost of the contract would be when various elements of LSA are added to the contract. Thus, they have little data to help them evaluate the contractor's price proposals for LSA.

Appendix A: Interview Guide

I. Demographic
  A. Biographical
      1. Name (optional)-

      2. Rank or GS rating-

      3. Job title-

      4. AFSC or civilian equivalent-

      5. Office symbol-

  B. Educational Background
      1. Degree (associate, bachelor, master)-

      2. Year graduated

      3. Continuing education that apply to LSA

          a. AFIT

          b. Ft. Lee

          c. Etc.

      4. PME

  C. Experience

      1. LSA experience

      2. How long at present job

II. Job duties (list all your duties that pertain to LSA)

Rate each duty above according to the scales shown below in A, B, & C.

A. Criticality to performance of LSA:
    1. Noncritical
    2. Somewhat critical
    3. Critical
    4. Very critical
    5. Extremely critical

B. Amount of training needed to learn the task:
    1. None
    2. One hour or less
    3. Four hours or less
    4. One day or less
    5. One week or less
    6. One month or less
    7. More than a month

C. Frequency (how often task is done):
    1. At least daily
    2. At least weekly
    3. At least monthly
    4. At least quarterly
    5. At least semi-annually
    6. At least annually
    7. Less often than once a year

D. What percentage of total duty time is spent performing LSA.

III. Knowledge & skills necessary for LSA (which, if any, of the below are necessary or helpful to perform LSA — please feel free to add to the list)

A. Technical skills (maintenance, engineering, operations, etc.)

B. Analytical Support Skills

    1. Statistics

    2. Linear Programming

    3. PERT

    4. Queueing Theory

    5. Decision Theory

    6. Algorithm development

C. Systems Management

    1. Systems Theory

2. Modeling

D. Life Cycle Costing

E. Computer

    1. Use

    2. Language Types

    3. Programming

    4. Simulation

F. Technical drawing or drafting

G. Writing

    1. General

    2. Contracts

    3. Specifications

H. Speaking

    1. Meetings & conferences

    2. Technical briefings

I. Supervisory Skills

J. Budget (Accounting & Finance procedures)

K. Selecting & applying appropriate specifications

    1. What methods to select

    2. Decision criteria for applying

L. Contract documentation

    1. Contracting experience or knowledge

M. Statements of Work

    1. Technical knowledge required

    2. What areas (engineering or math)

N. Tech Order System Knowledge

O. Reliability/Maintainability

1. Maintainence background

2. MTBF & MTTR calculations

3. Maintenance Deficiency Report/Quality Deficiency Report

P. Mil Standards

Q. Safety (design considerations)

R. Security

S. Supply

IV. Which of the required skills and knowledge did you possess when assigned to LSA?

V. What items do you think should be included in a course for LSA managers?

Appendix B: AFIT Course Titles

SYS 100   Introduction to Acquisition Management

SYS 200   Acquisition Planning and Analysis

LOG 220   AFLC Material Management

LOG 224   Logistics Management

LOG 225   Acquisition Logistics

SYS 228   Applied Configuration Management

SYS 230   AF Tech Order Acquisition and Management

LOG 260   Provisioning Management

QMT 353   Introduction to Life Cycle Costing

Appendix C: <u>Related</u>, <u>Uncited Research Sources</u>

Department of the Air Force. <u>Professional Continuing Education Eligibility and Course Description</u>. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, July 1980.

Department of the Air Force. <u>Weapon System and Equipment Support Analysis Management and Application Handbook</u>. AFP 800-XX(Draft). Contract F33615-81-C-0016. Air Force Human Resources Laboratory, Wright-Patterson AFB OH, undated.

Department of Defense. <u>Defense Management Education and Training</u>. DoD 5010.16-C. Washington: Government Printing Office, December 1982.

Department of Defense. <u>Logistics Support Analysis</u>. Mil--Std--1388-1A. Washington: Government Printing Office, 11 April 1983.

Herkimer, B.J. <u>Logistics Support Analysis Training</u>. NOR83-133. Aircraft Division, Northrop Corporation, Hawthorne CA, undated.

Bibliography

1. Air Force Systems Command. <u>Identification of Logistics Officer Job Type Groups</u>. AFHRL-70-39. Brooks AFB TX, October 1970.

2. Albro, Paul W. "Aerospace Requirements for Logistics Education," <u>Third Annual Logistics Educational Symposium</u>. 18-20. Hill AFB UT, 14-15 May 1968.

3. Blanchard, Benjamin S. <u>Logistics Engineering and Management</u>. Englewood Cliffs NJ: Prentice-Hall Inc., 1981.

4. Davis, Lieutenant Colonel Marvin L., USAF. "The Challenge for Logisticians -- The Future," <u>Air Force Journal of Logistics</u>, <u>6</u>: 3-6 (Summer 1982).

5. Dempsey, William and Richard O. Lancioni. "Thoughts on Improving Business Logistics Education and Academic Industry Interaction," <u>Logistics Spectrum</u>, <u>13</u>: 28, 32-34 (Summer 1979).

6. Department of the Air Force. <u>Instructional Systems Development</u>. AFM 50-2. Washington: HQ USAF, 25 May 1979.

7. ------. <u>Instructional Systems Development (ISD)</u>. AFR 50-8. Washington: HQ USAF, 10 July 1981.

8. ------. <u>Principles and Techniques of Instruction</u>. AFM 50-62. Washington: HQ USAF, 1 April 1974.

9. Geisler, Murray A. "Views on Logistics Education From a Systems Standpoint," <u>Third Annual Logistics Educational Symposium</u>. 49-53. Hill AFB UT, 14-15 May 1968.

10. Harrison, Gerald L., Jr. "The Acquisition Logistician: A Case for New Education Programs in Logistics," <u>Logistics Spectrum</u>, <u>15</u>: 9-13 (Spring 1981).

11. Henn, Carl L. "Modern Logistics: A Professional's Profession," <u>Logistics Spectrum</u>, <u>10</u>: 18-21, 33 (Summer 1976).

12. Hull, Major John R. and Captain Gregory L. Lockhart. <u>Barriers to Fully Implementing Integrated Logistics Support (ILS) in System Acquisition as Perceived by ILS Managers and Program Managers at the Aeronautical Systems Division</u>. MS Thesis, LSSR 36-82. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, September 1982 (AD-A122979).

13. Kline, Melvin B. "Integrated Logistics Support and Logistics Education," Third Annual Logistics Educational Symposium. 34-40. Hill AFB UT, 14-15 May 1968.

14. Knox, Captain John A. and Captain Thomas N. Thede. A Survey of Logistics Support Analysis Implementation Within Aeronautical Systems Division Program Offices. MS Thesis, LSSR 101-83. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, September 1983 (AD-A135568).

15. LaLonde, Bernard J. and James R. Riley. "Some Thoughts on the Changing Nature of Logistics Education," Logistics Spectrum, 11: 21-23 (Winter 1977).

16. "LOG-ED -- Logistics Education for Air Force Civilians," Logistics Spectrum, 13: 27-28 (Winter 1979).

17. Mazer, Colonel Nathan H., USAF (Ret.). "Location Logistics," Logistics Spectrum, 10: 11-12 (Spring 1976).

18. Plata, E.F. "Logistics Support Analysis: Its Purpose and Scope," Logistics Direction, 4: 18-22 (January 1980).

19. ------ and C.R. Spinner. "Logistics Support Analysis Development and Implementation," Logistics Direction, 4: 23-27 (January 1980).

20. Rachmel, Leo. "Education and the Logistician," Third Annual Logistics Educational Symposium. 44-48. Hill AFB UT, 14-15 May 1968.

21. Reynolds, John I. and Warren Rose. "Career Patterns in Physical Distribution: Implements for PDM Education," Logistics Spectrum, 12: 37-42 (Fall 1978).

22. Stewart, Donald I. "Changing Logistics Educational Requirements," Third Annual Logistics Educational Symposium. 41-43. Hill AFB UT, 14-15 May 1968.

23. Waters, Edmund A. "Education and Training for Logistics Engineering Personnel in Aerospace Industry," Third Annual Logistics Educational Symposium. 27-33. Hill AFB UT, 14-15 May 1968.

24. Wojciechowski, Donald, Captain, USAF. Request to Establish a New Professional Continuing Education Short Course (AF Form 19). Hq AFSC/ALXL, Andrews AFB MD, 13 September 1983.

VITA

Captain Gary L. Davis was born on 23 June 1949 in Dodge City, Kansas. He graduated from high school in Dodge City in 1967 and attended Kansas State University from which he received the degree of Bachelor of Science in Mechanical Engineering in December 1971. He entered the Air Force in March 1972 and received his commission from Officer's Training School in July 1974. He completed training as an Electronics Systems Maintenance Officer in April 1975. He then served as Maintenance Officer at Detachment 6, 1CEVG, Bayshore RBS, Michigan, and as Operations Officer, Detachment 460, AFTAC, Eielson AFB, Alaska. He was then assigned as Chief of Instruction, 3454 Technical Training Squadron, Lowry AFB, Colorado, until entering the School of Systems and Logistics, Air Force Institute of Technology, in June 1983.

    Permanent address: Rural Route #3
                        Dodge City, Kansas 67801

VITA

Captain Roger D. Edwards was born on 25 November 1951 in Richlands, Virginia. He graduated from high school in Mt. Gilead, Ohio in 1970 and attended Miami University, Oxford, Ohio, earning a Bachelor of Science degree in Industrial Technology in June 1974. Upon graduation, he received a commission in the USAF through the ROTC program. In October 1975, he completed navigator training and received his wings at Mather AFB, California. He then served as a navigator and instructor navigator in the 772nd Tactical Airlift Squadron (TAS), Dyess AFB, Texas. He then moved to the 34th Tactical Airlift Training Group (TATG) at Little Rock AFB, Arkansas. There he served in the 62nd TAS as an instructor and flight examiner for C-130 upgrade training. Also in the 34th TATG, he served in the 34th TAS as a classroom instructor, lesson plan author, and end-of-course test monitor for the C-130 instructor training, until entering the School of Systems and Logistics, Air Force Institute of Technology, in June 1983.

> Permanent address: 2975 County Road 27
>
> Edison, Ohio 43320

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION	1b. RESTRICTIVE MARKINGS
UNCLASSIFIED	

2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	Approved for public release; distribution unlimited.

4. PERFORMING ORGANIZATION REPORT NUMBER(S)	5. MONITORING ORGANIZATION REPORT NUMBER(S)
AFIT/GLM/LSM/84S-12	

6a. NAME OF PERFORMING ORGANIZATION	6b. OFFICE SYMBOL (If applicable)	7a. NAME OF MONITORING ORGANIZATION
School of Systems and Logistics	AFIT/LS	

6c. ADDRESS (City, State and ZIP Code)	7b. ADDRESS (City, State and ZIP Code)
Air Force Institute of Technology Wright-Patterson AFB, Ohio 45433	

8a. NAME OF FUNDING/SPONSORING ORGANIZATION	8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER

8c. ADDRESS (City, State and ZIP Code)	10. SOURCE OF FUNDING NOS.			
	PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.	WORK UNIT NO.

11. TITLE (Include Security Classification)
See Box 19

12. PERSONAL AUTHOR(S)
Gary L. Davis, B.S., Capt, USAF   Roger D. Edwards, B.S., Capt, USAF

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Yr., Mo., Day)	15. PAGE COUNT
MS Thesis	FROM _____ TO _____	1984 September	72

16. SUPPLEMENTARY NOTATION

Approved for public release: IAW AFR 190-17.
LYNN E. WOLAVER   14 Sept 84
Dean for Research and Professional Development
Air Force Institute of Technology (ATC)
Wright-Patterson AFB OH 45433

17.	COSATI CODES		18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB. GR.	Logistics, Logistics Management, Logistics Support, Training, Education, Systems Analysis
05	09		
15	05		

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

Title: DETERMINATION OF TRAINING REQUIREMENTS FOR NEW LOGISTICS SUPPORT
         ANALYSIS MANAGERS USING INSTRUCTIONAL SYSTEMS DEVELOPMENT

Thesis Advisor: Dr. William B. Askren

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION
UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS ☐	UNCLASSIFIED

22a. NAME OF RESPONSIBLE INDIVIDUAL	22b. TELEPHONE NUMBER (Include Area Code)	22c. OFFICE SYMBOL
Dr. William B. Askren	513-255-3871	AFHRL/LRA

DD FORM 1473, 83 APR   EDITION OF 1 JAN 73 IS OBSOLETE.

This study used the first two steps of the Instructional Systems Development (ISD) process to determine the training requirements of new managers of Logistics Support Analysis (LSA) in Air Force System Program Offices. Thirty-six structured interviews were conducted in person and by telephone to gather the data.

The data analysis identified 25 knowledge and skill areas important to LSA management. It also indicated that new LSA managers generally lacked experience or ability in at least 70 percent of these areas. Only 8 of these areas were identified as areas where some new LSA managers have any experience or skill. The analysis also indicated a lack of adequate training on the Air Force LSA program.

The results of this study indicate a need for persons appointed as LSA managers to have stronger technical backgrounds. It also identifies the need for a course on LSA. The study indicates the basic background requirements for LSA managers and makes recommendations for improving the Air Force LSA training program.

DATE
ILME